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SURVEY OF FISHES, AMPHIBIANS, AND REPTILES OF THE CONNEAUT CREEK DRAINAGE SYSTEM, ASHTABULA COUNTY, OHIO

TIMOTHY O. MATSON, ROBERTA L. MUEHLHEIM, AND **JAMES C. SPETZ***
The Cleveland Museum of Natural History
1 Wade Oval Drive, Cleveland, Ohio 44106-1767
tmatson@cmnh.org

ABSTRACT

A survey of fishes, amphibians, and reptiles was conducted in the Ohio portion of the Conneaut Creek drainage system, Ashtabula County, during the years 1996–2003. Objectives of the survey were to determine the species composition of fishes, amphibians, and reptiles; to estimate their abundances; and to determine their respective geographic distributions within the Ohio portion of the watershed. Qualitative and quantitative occurrence data were compiled from multiple sources for 83 sites in two townships and one incorporated community. In all, 75 species of fishes plus two hybrid taxa, 19 species of amphibians, and 14 species of reptiles were documented for the watershed. Species richness and designated abundances at each site as well as occurrence and frequency of occurrence over all sites are presented. Drainage system records of 17 species of fishes and three species of reptiles were noted. The survey produced new township records for four species of amphibians and 11 species of reptiles. A record of *Sternotherus odorata* was documented for Ashtabula County. Three species of fishes previously known from the watershed were not encountered.

Introduction

Surveys of amphibians and reptiles are frequently done for political units such as counties or townships or for other usually smaller artificial units such as parks or natural areas. Data collected in these anthropogenic geographic units can easily be plotted on maps and used for referencing presence/absence, local abundance, and coarse-grained geographic distribution. Fish surveys often conform with this methodology but are conducted at easily accessible sites at disjunct locales, the data from which may be either coarse or fine grained. Fish data, however, are indicative of the species that live within the drainage system, typically a naturally occurring geomorphically and geographically defined entity. Fine-grained data based upon many proximate sites provide a good temporal picture of the geographic distribution and abundance of species within that watershed and are often more useful for future environmental studies, assessments, and planning than coarse-grained data.

We conducted a survey to determine the species composition of fishes, amphibians, and reptiles; to estimate their abundances; and to determine their respective geographic distributions within the Ohio portion of the Conneaut Creek drainage system in Ashtabula County. To achieve those objectives, records were compiled from published reports, from the Ohio Environmental Protection Agency FINS (Fish Information Network System) database, from field survey

*Current address: Cleveland Metropark Systems, 4101 Fulton Parkway, Cleveland, OH 44144

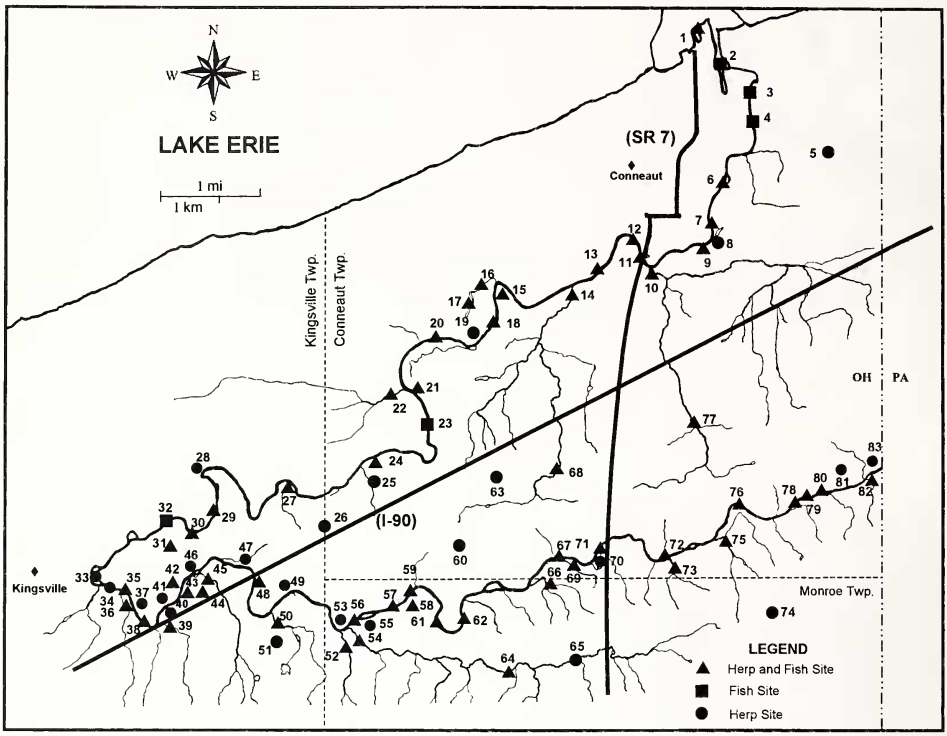

Figure 1. Map of the Ohio portion of Conneaut Creek drainage system showing 83 survey site locations.

reports conducted by the United States Fish and Wildlife Service, from the ichthyology and herpetology collections of the Cleveland Museum of Natural History, and from our extensive recent field surveys.

Site Description

The headwaters of Conneaut Creek are in northwestern Pennsylvania from where it courses westward into Ashtabula County, the most northeastern county of Ohio. Of its total drainage area of 495.2 km^2 (191.2 mi^2), the lower 20 percent or 97.6 km^2 (37.7 mi^2) is located in Ohio (Ohio Department of Natural Resources Division of Water, 1960). Conneaut Creek enters the Central Basin of Lake Erie through Conneaut harbor in the city of Conneaut, Ohio; it flows through Monroe and Kingsville townships and Conneaut Incorporated. Few 3rd order tributary streams drain into the Ohio portion. Most tributaries are either 1st or 2nd order, and none have recognized names (USGS 7.5 minute series topographic maps: Conneaut 1996 and North Kingsville 1994).

Two physiographic sections are represented in Ashtabula County (Anderson, 1983; Brockman, 2002). The Erie Lake Plain Section (Brockman, 2002), a northeastern extension of the Huron-Erie Lake Plains of the Central Lowland Province, extends along Lake Erie as lake plain in a narrow zone approximately 5.6 km (3.5 mi) wide near Conneaut (White and Totten, 1979, p. 4). The Erie Lake Plain is bordered on the south by the Portage Escarpment (Brockman, 2002), a transitional belt approaching 4.8 km (3 mi) in width that increases in elevation to the south (White and Totten, 1979, p. 4). The Glaciated Allegheny Plateaus (Brockman, 2002), the western portion of the Appalachian Plateaus Province, rises above the Portage Escarpment to the south (White and Totten, 1979; White, 1982).

Pleistocene glacial deposition with concurrent and subse-

Figure 2. Conneaut Creek valley within the Portage Escarpment showing the steep Chagrin Shale northeast facing slope with two patches of snow remaining. Photograph taken 2 April 2003 on the forested flood-plain of site 38, The Cleveland Museum of Natural History Blakeslee Barrows Preserve.

Figure 3. Second order tributary stream of Conneaut Creek showing a cascading waterfall over Chagrin Shale and a closed canopy of deciduous trees and eastern hemlock. Photograph taken 2 April 2003 of the northwest facing slope at The Cleveland Museum of Natural History Hubbard preserve.

quent erosion have sculptured the current landscape. The Erie Lake Plain is in general flat, poorly drained, and mostly covered with lacustrine silts, sands, and gravels overlaying glacial tills. It is traversed by several beach ridges most of which are fragmented and breeched by eroding streams and/or wave action from higher, earlier glacial lake stages.

The Portage Escarpment bedrock is overlaid with a series of parallel end moraines (White and Totten, 1979). In far

Figure 4. Seasonal channel pond on the forested Conneaut Creek flood-plain. Photograph taken 2 April 2003 of the northwest facing slope at The Cleveland Museum of Natural History Hubbard preserve about 50 m east of mouth of the tributary stream of Figure 3.

northeastern Ohio, the Painesville Moraine lies on the upper part of the escarpment and is characterized by rolling topography with till hummocks reaching 9 m (30 ft) (White and Totten, 1979, p. 11). The Ashtabula Moraine lies north and parallel to the Painesville Moraine on the lower part of the escarpment. Knolls up to 9 m (30 ft) in elevation create rolling, hummocky topography (White and Totten, 1979, p. 11).

Conneaut Creek flows westward from Pennsylvania in the deep gorge separating the Painesville Moraine to the south and the Ashtabula Moraine to the north. About 1.1 km (0.7 mi) east of Kingsville the creek abruptly bends north (Figure 1) through a large gap in the Ashtabula Moraine and then flows eastward on the lake plain between the Ashtabula Moraine on the south and Arkona beach ridge on the north. Blockage of the old Conneaut Creek channel by ice with deposition of the Whittlesey beach ridge of sands and gravels forced Conneaut Creek eastward. The creek then flows eastward about 5.6 km (3.5 mi) where it breeches the Arkona beach ridge near Camp Peet and courses northeastward across the lake plain toward Lake Erie (White and Totten, 1979). Ohio tributaries to Conneaut Creek head either on the lake plain or on the escarpment.

The Conneaut Creek gorge (Figure 2) and the valleys of most 2nd and 3rd order streams are incised through the glacial deposits to expose and/or flow upon the underlying Chagrin Shale. Cascading falls, some in excess of 10 m high, over shale and siltstone bedrock are common (Figure 3). Siltstone slabs are common in stream channels and are often exposed on the valley slopes. Glacial erratics, in addition to cobble, gravel, sand, and silts derived from local rock, occur in sufficient quantities and arrays to produce

manifold habitats. Some 2nd and 3rd order streams that have morainic heads in forested areas and flow either entirely within the escarpment or partially on lake plain have water temperatures that seldom exceed 21°C, even in years with prolonged drought conditions and above normal ambient temperatures.

Channel-margin pools, abandoned flood-plain channel ponds (Figure 4), and perched seasonal terrace ponds are present within the Conneaut Creek valley. Several abandoned channel ponds support luxuriant aquatic vascular plant communities.

Geographically the Conneaut Creek watershed is located in the northeastern Ohio Lake Erie snowbelt. Cold westerly and northwesterly winter winds across an open Lake Erie are warmed, pick up moisture, and rise slowly from the beach at an elevation of about 208 m (571 ft) across the lake plain. From Cleveland eastward the winds are deflected upward rapidly over the escarpment where thermal decline produces increased precipitation, often in the form of snowfall. The elevation of the southern boundary of the Painesville Moraine approaches 275 m (900 ft; USGS Conneaut, Ohio 1996 topographic map). Climatic data recording stations between Cleveland at 235 m (770 ft) and the city of Ashtabula at 211 m (690 ft) on the lake plain and in Dorset about 12.8 km (8 miles) south of the Painesville Moraine on the Glaciated Allegheny Plateaus at 299 m (980 ft) indicate an increase in mean annual snowfall and precipitation with decreasing mean annual temperature from west to east (Midwest Regional Climate Center, Champaign, Illinois). These climatic conditions interact to produce environs that tend to be cool and moist and are indicative of those farther north.

Mixed hardwoods with eastern hemlock cover much of the flood plain of Conneaut Creek. Gorge slopes and valleys of the tributaries are cool, moist growing sites and eastern hemlock-hardwood forests with striped maple are widespread (Figure 3). Densely shaded, cool environments occur in most ravines of both the escarpment and lake plain.

Materials and Methods

Records of occurrence of taxa within the Conneaut Creek drainage system were compiled from multiple sources. Field survey records of lamprey were provided by the United States Fish and Wildlife Service and include species recorded during larval lamprey population censuses and those individuals of all age cohorts salvaged during lampricide application (unpublished data, U.S. Fish and Wildlife Service, Marquette Biological Station). Fish survey records were obtained from the Ohio Environmental Protection Agency FINS database (unpublished data, Ohio EPA). Published drainage records for fish were recorded from Trautman (1981). The fish collection of The Cleveland Museum of Natural History, which includes the Andrew White Collection originally at John Carroll University, provided many specimens and much data. All specimens collected during the years of field survey by the CMNH were deposited in the fish and herpetology sections of the Museum's vertebrate collections.

Published township records of occurrence for anurans were compiled from Walker (1946), Pfingsten (1998), and Davis and Menze (2000); published township records for salamanders were obtained from Pfingsten and Downs (1989), Pfingsten (1998), and Pfingsten and Matson (2003); and published records of reptiles were obtained from Conant (1951) and Zemco (1974).

Intensive study of the fish, amphibians, and reptiles for the Ohio portion of Conneaut Creek watershed by the primary investigator began in 1996; it became a priority in 1999 and continued into April 2003. Nets were used to capture fish; 1.8 m and 3.7 m seines and 3.7 m and 7.3 m bag seines all having 0.47 cm mesh were used. Sites were seined and/or dip netted repeatedly during each visit until no additional species were netted.

Amphibians were surveyed through visual encounter, by overturning rocks, slabs, logs, and trash and by anuran call recognition. Sites were visited during several seasons and varying times of the day. Amphibians were captured by hand, by seining and dip-netting for larvae, by using modified cylindrical minnow traps and screened box traps (Heyer et al., 1994).

Reptiles were surveyed through encounter, by overturning objects laying on the ground, by trapping, and through road kill. Metal sheets were laid on the ground in various habitats at sites 37, 41, 42, and 58 to aide in attracting lizards and snakes. Baited funnel turtle traps with 0.75 m and 0.9 m diameter hoops and having 2.5 cm mesh were used to capture turtles.

Erythrocyte size was used to differentiate diploid from polyploid individuals of the *Ambystoma jeffersonianum* complex (Pfingsten and Downs, 1989; Uzzell, 1964). Recognition of the advertisement call served to separate male tetraploid *Hyla versicolor* from diploid *H. chrysoscelis* (Matson,1990); erythrocyte size (Matson, 1990) and geographic distribution (Pfingsten, 1998; Davis and Menze, 2000) were used to differentiate their tadpoles.

Amphibians and fishes were salvaged at various sites during and within a day following application of the lampricide TFM (3-trifluromethyl-4-nitrophenol) in 1986, 1991, 1995, 2000 and in 2003 by museum staff and field survey personnel from several state and federal agencies.

Geographical longitudinal and latitudinal coordinates for each site are listed in Appendix 1. Site numbers in the appendices reference those plotted on the drainage system map of Figure 1. Where appropriate, a descriptive locality name is given for a site to facilitate positioning on a topographic map.

This survey did not include man-made backyard ponds created for home owner fire insurance coverage or farm

ponds typically stocked with largemouth black bass, sunfish, and channel catfish. These ponds generally provide suitable habitat for a repetitive and predictable array of amphibian and reptile species.

The number of individuals of each taxon encountered at each site during each visit was recorded and was later used to assign an abundance designation to each taxon at that site. The abundance of a species at a site is a subjective evaluation by the principle investigator and reflects the number of individuals over all life stages observed per visit and summed over all visits to the sites using all methodologies. No attempt was made to standardize sampling effort as that would have been counter productive because all vertebrate classes surveyed were sampled simultaneously and all available habitats were included. Some sites were surveyed once whereas others were visited as many as 11 times. The status designations assigned to each species or taxon recorded are as follows:

abundant — numerous and widespread within the site (high density with high frequency of encounter).

common — present at many localities within the site (low to moderate densities with moderate frequency of encounter).

uncommon — present at few localities within the site (low to moderate densities with low frequency of encounter).

rare — few individuals present at restricted localities (very low density with very low frequency of encounter).

present — only one individual of the taxon was vouchered with no quantitative assessment of the number of individuals encountered at the site during a single survey; the assignment of an abundance designation seems premature.

present ( ) — the taxon was represented by tadpoles (T), larvae (L), or eggs (E) only.

— the number of individuals of a taxon recorded at a site was low, and we considered the data insufficient to accurately assign an abundance designation.

A-R (#) — the site was surveyed more than once and sufficient data were available to assign an abundance designation. This form of designation was used for amphibian taxa that utilize only one medium (aquatic or terrestrial; e.g., *Necturus* and *Plethodon,* respectively) where larvae, juveniles, and adults have similar probabilities of encounter using the same search methodologies. It was also applied to reptiles that often occur in relatively low numbers even when common because of their higher trophic status. The quantitative data should facilitate future comparisons.

Some species of fish occur only in the tributaries, others occur only in the main creek, whereas others occur in both stream categories. An abundance designation does not necessarily indicate equal numbers of individuals encountered when applied to different taxa or to the same taxon when found in both tributaries and Conneaut Creek.

The occurrence, the total number of sites at which a taxon was recorded, and the frequency of occurrence (*f*) in percent were calculated as a means of censussing taxa over all appropriate sites (Smith and Smith, 2001). This method is merely an indicator for comparative purposes because sites were of unequal size and the times spent searching sites were not equal. The total number of fish sites used in the frequency calculation was 59 whereas the number of amphibian/reptile sites was 77.

Binomial names and common names of fishes used are in accordance with those of the American Fisheries Society (Robins et al., 1991); names of amphibians and reptiles used are those published by the Society for the Study of Amphibians and Reptiles (Crother, 2001) with one exception. The name *Ambystoma platineum* (Silvery Salamander) was conserved (Frost, 1985) to refer to the triploid member of the *A. jeffersonianum* complex having the unisexual biotype JJL (Petranka, 1998, p. 124). Taxa not included in appendices are authored in the text.

Results and Discussion

Data compiled from all sources represent 83 different survey sites (Figure 1; Appendix 1) within the Conneaut Creek drainage system. Among those sites, 53 were surveyed for fishes, amphibians, and reptiles; 24 were only surveyed for amphibians and reptiles (no fish were present); and 6 were only surveyed for fishes. The fish community included 75 species plus two hybrid taxa (Appendix 2), whereas the herptofaunal community included 19 species of amphibians and 14 species of reptiles (Appendix 3).

Fish

Three species of fishes, the hornyhead chub (*Nocomis biguttatus* (Kirtland, 1840)), the common shiner (*Luxilus cornutus* (Mitchill, 1817)), and the eastern sand darter (*Ammocrypta pellucida* (Putnam, 1863)), mapped in Trautman (1981, p. 269, 341, 648, respectively) as occurring within the Conneaut Creek drainage system were not detected during our field surveys. The striped shiner (*L. chrysocephalus*) was widespread in both the tributaries and Conneaut Creek; because of its similarity in appearance to the common shiner (*L. cornutus*) it is feasible that the common shiner was overlooked. However, neither our field surveys nor those conducted by Ohio EPA detected the common shiner, and collection records for this taxon in the drainage precede 1955 (Trautman, 1981). Similarly, collection records for the hornyhead chub and the eastern sand darter in the drainage are prior to 1924 (Trautman, 1981, p. 269 and 648).

These species may be very rare or may be extirpated from the Ohio portion of the drainage; the status of these species upstream in the Pennsylvania portion of the watershed was not determined.

Brook stickleback (*Culaea inconstans*) were known from two locales on the escarpment in Conneaut Creek prior to 1954 (Trautman, 1981, p. 537). No tributary streams or wetlands found on the escarpment were supportive of brook sticklebacks during our survey. Brook sticklebacks only occurred at one site within the lake plain, an isolated pond on the Conneaut Creek flood-plain upstream of the SR 20 bridge.

Abundance designations for species found at many sites within the watershed and species richness between sites varied considerably. At least part of the apparent variation was attributed to differences in site habitat structure and available micro-habitats. Some sites contained deeper sections or holes scoured in the bedrock, whereas others were shallower and often had swifter water flows.

Seventeen species of fishes listed in Appendix 4 represent drainage system records not listed by Trautman (1981). Many of these species were probably present in the past, but they are either difficult to detect, rare in the watershed, or they are recent introductions. The northern brook lamprey (*Ichthyomyzon fossor*) is an Ohio endangered species (Ohio Department of Natural Resources Division of Wildlife, 2002).

Collection records of native lamprey (12 sites; Appendix 2) indicate occurrences downstream from the Creek Road covered bridge (site 21, river distance 11.7 km) in Conneaut, and 10 of these records occur downstream of the former Grant Street bridge (site 15) or within the first 5.5 river miles. The exotic sea lamprey (*Petromyzon marinus*) occurred at 22 sites throughout the Ohio portion of the drainage system.

Twenty-one species of fishes inhabited only the wide, deeper water sites from near the Center Road bridge (site 13) downstream to the harbor (Appendix 2). The distributions of four species of fishes were restricted to cool, shaded 2nd, 3rd, and large 1st order tributary streams (Appendix 2).

The fathead minnow (*Pimephales promelas*) was one of the rarest species of fishes encountered ($f = 3.4\%$). The normal color morph was only detected at site 14. An orange colored morph referred to as the "rosy red minnow" was found at site 10 in 2000. Three individuals were observed; two of those were collected and preserved. This color variant was first propagated during the early 1980s in Arkansas (Sutton, 1994) for the "feeder" market and then for the bait industry. The rosy red minnows observed in the tributary were probably introduced by sport fisherman or by local aquarists. Survivorship of the rosy red minnow is apparently lower than that of normally colored (wild-type) fatheads (Ludwig, 1996), especially during winter months. Sampling at this site in 2001 did not produce any color variants or wild-type colored fathead minnows.

Rainbow trout (*Oncorhynchus mykiss*) were recorded at only 12 sites. During spawning runs trout pass through all Conneaut Creek main stream sites and many migrate into Pennsylvania. Rainbow trout spawn successfully in a minimum of four Conneaut Creek tributaries. We observed young of the year (age 0) individuals 3–5 cm in total length in streams over multiple years during August with water temperatures reaching 21°C during drought years. The extended presence of predatory young of the year of this introduced species during the stream larval stage of *Desmognathus* and *Eurycea* may cause declines in local stream salamander recruitment through direct predation or through competition for invertebrate food resources. These potential interactions deserve further study.

Invasive round gobies (*Neogobius melanostomus*) were captured ($n = 8$) beneath the Pennsylvania Central Railroad bridge, site 6 (river distance 3.5 km) in mid July of 2002. The OEPA captured one goby at site 2 (river distance 0.2 km) in August 1998. This nuisance species (Office of the Great Lakes, 1996) has apparently expanded its geographic distribution upstream a minimum of 3.3 km since 1998.

Amphibians and reptiles

Three species of reptiles represent new drainage system records (Appendix 4). Five new township records were obtained for four species of amphibians, and 16 new township records were obtained for 11 species of reptiles (Appendix 5).

Jefferson Salamanders (*Ambystoma jeffersonianum*) with three occurrences and the Silvery Salamander (*A. platineum*) with one occurrence are rare species within the Conneaut Creek drainage system. The three sites from which these species were recorded are juxtaposed within the Portage Escarpment on the Blakeslee-Barrows Preserve and Richardson Tract of The Cleveland Museum of Natural History. One of the sites (Figure 1, site 40) was a flood-plain seasonal pool; the second site (41) was an old man-made pond situated above the flood plain on the edge of the upland forest; the third site (42) was an abandoned channel of Conneaut Creek that seasonally contains water. Both salamander species are known from few locales in Ashtabula County (Pfingsten, 1998; Pfingsten and Matson, 2003); the Silvery Salamander is known to be a gynogenetic species and must occur in syntopy with the Jefferson Salamander. We speculate that based upon the extent of our surveys and extensive use of larvae for detecting ambystomatid localities that few additional occurrences of these taxa will be documented in the Ohio portion of Conneaut Creek. An interesting biogeographic similarity exists between the locations of the sites where these taxa occur in Conneaut Creek and where *A. jeffersonianum* occurs in the Ashtabula River drainage (Matson, personal observations). The only known site for the Jefferson Salamander in the Ashtabula River drainage system is on the Portage Escarpment approximately 1.5 km east from where

the river breeches the Ashtabula Moraine and Whittlesey Beach Ridge to flow over the Erie Lake Plain. In the Conneaut Creek drainage system these taxa occur on the Portage Escarpment at sites about 1.1 km east (upstream) of the breech in the Ashtabula Moraine where the creek is deflected to the east over the Erie Lake Plain.

A record of the Northern Red Salamander (*Pseudotriton ruber* (Latreille, 1801)) and one of the Four-toed Salamander (*Hemidactylum scutatum* (Schlegel, 1838)) for Conneaut Incorporated were published by Pfingsten and Downs (1989). It is unclear from the stated locality description if either of these records is from within the Conneaut Creek drainage system or from within a small nearby tributary system draining directly into Lake Erie (R. A. Pfingsten personal communication, 2002). We did not encounter either of these species during our survey of the Conneaut Creek watershed even though considerable search effort was directed toward their detection. Recent records (1991 and 2002) for the Northern Red Salamander on the lake plain at the Kingsville Sand Barrens in Kingsville Township indicate its persistence adjacent to the Conneaut Creek drainage.

The Mudpuppy (*Necturus maculosus*) is now an uncommon and locally rare species in the Ohio portion of Conneaut Creek. But this was not always the case. Prior to the October 1986 application of the lampricide TFM, the Mudpuppy was a common to locally abundant amphibian. Former widespread abundance and stream distribution are based upon salvage collections made during and immediately following lampricide treatment. For example, 56 Mudpuppies were salvaged at the Center Road bridge site (site 67) in 1986. Subsequent searches during this survey and later salvage searches following TFM applications failed to reveal any individuals at this site. We contend that the four additional lampricide applications since 1987 have had a negative impact upon the recovery of this species (Matson, 1998).

Plethodon cinereus, the Red-backed Salamander, occurred at only 14 sites (f = 18.2%). Although apparently suitable upland forested habitat was available (Petranka, 1998), this salamander was usually encountered in small numbers. Annual spring and summer droughts over years probably contributed to its apparent small population sizes and low frequency of detection. The erythristic color morph of this species was found at four sites. One erythristic individual was found at each site, but two of the sites are proximate. This color morph was previously known from only one site in Ashtabula County (Pfingsten and Downs, 1989, p. 232).

Distribution records for Fowler's Toad (*Bufo fowleri*) in northeastern Ohio are confined to Lake and Ashtabula Counties. Six of the existing seven township records in these counties are on the lake plain and most are adjacent to Lake Erie (Walker, 1946; Davis and Menze, 2000; personal observations). All occurrence records for Fowler's Toads in the vicinity of Conneaut Creek are old records (pre-1946) listed near Farnham and near Conneaut (J. Davis, personal communication, 2003). No Fowler's Toads were detected near Farnham during this survey. However, this species occurred at four sites within the Conneaut Creek gorge. The toads were always either in the channel on sand/gravel bars or along the bank concealed beneath shale slabs. The distribution of this species in Conneaut Creek appears patchy, but additional survey work may fill in gaps and extend the range within the watershed. A similar distribution pattern is developing in the Ashtabula River drainage system. The main difference in the apparent distribution of the Fowler's Toad between the two drainage systems is that Fowler's Toad occurs at the Walnut Beach/Ashtabula Harbor area, whereas the American Toad occupies the Conneaut Harbor area (Matson, unpublished data). Currently, the range of Fowler's Toad in Conneaut Creek extends from site 13 (Center Road) to site 25 (Camp Peet) just north (downstream) of the Arkona Beach Ridge breech.

Three species of reptiles found during the survey were new drainage records (Appendix 4). The Eastern Spiny Softshell Turtle (*Apalone spinifera*) was trapped at three sites (n = 5), all on the lake plain. Trapping upstream of Locust Grove Campground (site 29) and downstream of the Conneaut Fish and Game Club (site 18) produced only captures of other turtle species. Additional occurrences both upstream and downstream are probable because suitable habitat exists in both directions. However, the softshell prefers waters with sand or mud bottoms (Ernst and Barbour, 1989, p. 105); the substrate throughout much of the Ohio portion of Conneaut Creek consists of water swept shales. Occurrences are predicted to be local and patchy. The only previously published record for this species in Ashtabula County was in the Grand River (Matson, 1985).

The Stinkpot (*Sternotherus odoratus)* was a rare turtle within the Conneaut Creek drainage system. One specimen, captured in April 2003 at site 82 (Figure 1) during a lampricide application, is a drainage record. We believe the first specimen vouchered from Ashtabula County was collected in Pymatuning Creek in 1997, but this is the first published occurrence record for the county. The specimen from Pymatuning Creek is preserved at the Cleveland Museum of Natural History. A photographic voucher of the Conneaut Creek specimen is also at the Cleveland Museum of Natural History. The Conneaut Creek channel provides few areas with slow current and soft substrate, the preferred habitat of the Stinkpot (Ernst and Barbour, 1989, p. 77). Some deep channel ponds and swamps within the drainage system appear to provide suitable habitat, but trapping results indicate this to be a rare turtle. The proximity of this site to the Ohio-Pennsylvania border coupled with the high water conditions the previous week may have swept the turtle downstream from Pennsylvania waters.

Conant (1951) cited a record of the Spotted Turtle (*Clemmys guttata*) near Farnham in Conneaut Incorporated. We encountered only one individual during our survey. The turtle was located crossing the road at site 76 near large flood-plain channel ponds that supported extensive aquatic vascular plant growth. Repeated trapping of this area over several years and numerous searches failed to detect additional individuals.

Former distribution records of the Queen Snake (*Regina septemvittata*) in the Conneaut Creek drainage system were near Conneaut (Conant, 1951, p. 79). We found new occurrences at sites in Kingsville and Monroe Townships as well as at several sites far upstream in Conneaut, nearly as far as the Ohio-Pennsylvania border. Our recent observations of Queen Snakes were all within the Portage Escarpment from site 47 upstream. Suitable habitat with numerous siltstone slabs was readily available through the Ohio portion of the Conneaut Creek drainage system, and *Orconectes propinquus* (Girard) and *Cambarus robustus* Girard crayfish were abundant food resources.

We have surveyed the fishes, amphibians, and reptiles at numerous sites within the Conneaut Creek drainage system and have attempted to assemble available records from several sources. Fish data from the OEPA and those from The Cleveland Museum of Natural History complemented our field surveys by providing records from wide, deep downstream sites for which we did not have appropriate collection equipment available. Temporal changes in the watershed due to development, landscape alteration, invasive species, and other perturbations will undoubtedly alter the composition and structure of the fish and herpetological communities.

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Appendix 1. Latitudinal and longitudinal coordinates and site names of the locales surveyed or for which species data were available from previous collections. Abbreviations used: dws = downstream; ups = upstream; CMNH = Cleveland Museum of Natural History.

Site Number	Latitude (N)	Longitude (W)	Township	Site Name
1	41° 58′ 10.2″	80° 33′ 8.8″	Conneaut	Conneaut harbor
2	41° 57′ 56″	80° 32′ 48″	Conneaut	
3	41° 57′ 44″	80° 32′ 33″	Conneaut	
4	41° 57′ 31″	80° 32′ 33″	Conneaut	
5	41° 57′ 8.0″	80° 31′ 50″	Conneaut	
6	41° 56′ 58.5″	80° 32′ 49.8″	Conneaut	Penn Central Railroad
7	41° 56′ 32.9″	80° 33′ 1.4″	Conneaut	Main St. Bridge ups to SR 20
8	41° 56′ 30″	80° 32′ 57″	Conneaut	North side of SR 20 Bridge
9	41° 56′ 23.0″	80° 33′ 13.0″	Conneaut	
10	41° 56′ 8.0″	80° 33′ 42″	Conneaut	
11	41° 56′ 13.5″	80° 33′ 46.9″	Conneaut	SR 7 Bridge north of Welton Rd.
12	41° 56′ 16.0″	80° 33′ 51.2″	Conneaut	Mill Rd. Crossing
13	41° 56′ 11.5″	80° 34′ 18.0″	Conneaut	Center Rd. Bridge ups
14	41° 55′ 59.6″	80° 34′ 40.6″	Conneaut	
15	41° 56′ 0.1″	80° 35′ 23.9″	Conneaut	Grant St. Bridge
16	41° 56′ 2.6″	80° 35′ 42.2″	Conneaut	Conneaut Fish and Game Club beaver dam
17	41° 55′ 57.2″	80° 35′ 49.8″	Conneaut	Conneaut Fish and Game Club swamp
18	41° 55′ 43.3″	80° 35′ 33.9″	Conneaut	Conneaut Fish and Game Club CC
19	41° 55′ 37.0″	80° 35′ 51.5″	Conneaut	Conneaut Fish and Game Club forest
20	41° 55′ 37.0″	80° 36′ 16.3″	Conneaut	Gaging Station at Keefus Rd.
21	41° 55′ 12.0″	80° 36′ 36.0″	Conneaut	Creek Rd. Covered Bridge
22	41° 55′ 7.0″	80° 36′ 45.0″	Conneaut	
23	41° 54′ 50.1″	80° 36′ 20.7″	Conneaut	Camp Peet
24	41° 54′ 32.0″	80° 37′ 3.1″	Conneaut	Camp Peet ponds
25	41° 54′ 25.8″	80° 37′ 1.8″	Conneaut	Camp Peet
26	41° 54′ 0.00″	80° 37′ 26.3″	Conneaut	Markko Vineyard
27	41° 54′ 20.3″	80° 37′ 58.3″	Kingsville	
28	41° 54′ 30.7″	80° 37′ 58.3″	Kingsville	
29	41° 54′ 10.7″	80° 38′ 46.2″	Kingsville	Locust Grove Campground
30	41° 54′ 1.0″	80° 39′ 0″	Kingsville	
31	41° 53′ 57.4″	80° 39′ 11″	Kingsville	
32	41° 54′ 0.5″	80° 39′ 20″	Kingsville	
33	41° 53′ 34.0″	80° 40′ 7″	Kingsville	
34	41° 53′ 33″	80° 40′ 4″	Kingsville	Ridge Rd. Bridge
35	41° 53′ 17″	80° 38′ 42″	Kingsville	CMNH Blakeslee Barrows Preserve
36	41° 53′ 20.2″	80° 39′ 48.3″	Kingsville	
37	41° 53′ 23″	80° 38′ 42″	Kingsville	CMNH Blakeslee Barrows Preserve
38	41° 53′ 38.0″	80° 40′ 9″	Kingsville	CMNH Blakeslee Barrows Preserve
39	41° 53′ 13″	80° 39′ 23.5″	Kingsville	CMNH Richardson Tract/Blakeslee Barrows Preserve
40	41° 53′ 19″	80° 39′ 25″	Kingsville	
41	41° 53′ 23″	80° 39′ 30″	Kingsville	CMNH Blakeslee Barrows Preserve
42	41° 53′ 29″	80° 39′ 18″	Kingsville	CMNH Blakeslee Barrows Preserve
43	41° 53′ 25″	80° 39′ 16″	Kingsville	CMNH Richardson Tract/Blakeslee Barrows Preserve
44	41° 53′ 21″	80° 39′ 7″	Kingsville	CMNH Richardson Tract/Blakeslee Barrows Preserve
45	41° 53′ 35″	80° 38′ 30″	Kingsville	CMNH Richardson Tract/Blakeslee Barrows Preserve
46	41° 53′ 34″	80° 39′ 13″	Kingsville	
47	41° 53′ 47.27″	80° 38′ 23.5″	Kingsville	
48	41° 53′ 31.4″	80° 38′ 19.6″	Kingsville	CMNH Hubbard Preserve
49	41° 53′ 33″	80° 38′ 10″	Kingsville	
50	41° 53′ 9.8″	80° 37′ 54″	Kingsville	CMNH Hubbard Preserve
51	41° 53′ 5.3″	80° 38′ 9″	Kingsville	CMNH Hubbard Preserve
52	41° 53′ 0.1″	80° 37′ 18.2″	Monroe	
53	41° 53′ 13.0″	80° 37′ 22.4″	Monroe	
54	41° 53′ 4.3″	80° 37′ 9.9″	Monroe	Hatch Corners Rd. at State Rd.
55	41° 53′ 10.1″	80° 37′ 4.9″	Monroe	
56	41° 53′ 10.0″	80° 37′ 15.0″	Monroe	State Rd./Turnpike Rd. Bridge
57	41° 53′ 19.7″	80° 36′ 45″	Monroe	State Rd. Bridge ups
58	41° 53′ 19.0″	80° 36′ 28″	Monroe	
59	41° 53′ 27.9″	80° 36′ 32.1″	Monroe	Horton Rd. Bridge dws
60	41° 53′ 50″	80° 36′ 3.3″	Conneaut	Southeast of South Ridge at Keefus Rd.
61	41° 53′ 14.5″	80° 36′ 19.9″	Monroe	
62	41° 53′ 11.8″	80° 35′ 58″	Monroe	Horton Rd. Bridge area
63	41° 54′ 29.0″	80° 35′ 36.1″	Conneaut	Underridge Rd. at Blood Rd.
64	41° 52′ 45.9″	80° 35′ 29.9″	Monroe	Wetmore Rd. Bridge ups
65	41° 52′ 55″	80° 34′ 43.2″	Monroe	Hatch Corners roadside ditch
66	41° 53′ 31″	80° 34′ 58″	Monroe	
67	41° 53′ 43.0″	80° 34′ 50.8″	Conneaut	Center Rd. Bridge
68	41° 54′ 27″	80° 34′ 51″	Conneaut	Horton Rd. at powerline
69	41° 53′ 39.1″	80° 34′ 41.8″	Conneaut	

Site Number	Latitude (N)	Longitude (W)	Township	Site Name
70	41° 53′ 39.6″	80° 34′ 22.6″	Conneaut	SR 7 and Center Rd. triangle
71	41° 53′ 45.3″	80° 34′ 23″	Conneaut	Center Rd. Bridge to ups of SR 7 Bridge
72	41° 53′ 41.3″	80° 33′ 35.9″	Conneaut	Blakesley Rd. terminus
73	41° 53′ 34.3″	80° 33′ 29.3″	Conneaut	
74	41° 53′ 15.2″	80° 32′ 30.8″	Conneaut	
75	41° 53′ 49.2″	80° 32′ 54.2″	Conneaut	
76	41° 54′ 7.3″	80° 32′ 47.9″	Conneaut	Middle Rd. Bridge dws
77	41° 54′ 50.3″	80° 33′ 16.6″	Conneaut	Underridge Rd. at Damon Rd.
78	41° 54′ 4.4″	80° 32′ 12.8″	Conneaut	
79	41° 54′ 11.1″	80° 31′ 57.5″	Conneaut	Furnace Rd. Bridge dws
80	41° 54′ 12.0″	80° 31′ 48.6″	Conneaut	
81	41° 54′ 20.5″	80° 31′ 30.0″	Conneaut	
82	41° 54′ 18.7″	80° 31′ 13.1″	Conneaut	Furnace Rd. Bridge ups
83	41° 54′ 28.9″	80° 31′ 17.1″	Conneaut	

Appendix 2. Taxa of fishes and an abundance designation for each taxon recorded at each site. See methods section (p. 3–6) for an explanation of designation symbols. Letters in parentheses following a binomial name indicate the status within Ohio as classified by ODNR Division of Wildlife (2002): (E) Endangered, (T) Threatened. Species followed by an asterik (*) occurred downstream from Center Road Bridge (site 13) only. Species followed by superscript ([2]) only occurred in 2nd, 3rd, or large 1st order tributaries.

Species \ Site	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Petromyzontidae																		
Ichthyomyzon fossor Reighard and Cummins, 1916 (E)							R–U											
Ichthyomyzon unicuspis Hubbs and Trautman, 1937							R–U		R				R		R			
Lampetra appendix (DeKay, 1842)		R				R	R				R		R					
Petromyzon marinus Linnaeus, 1758		U	R			A	A		A		A		A		A			
Lepisosteidae																		
Lepisosteus osseus (Linnaeus, 1758)	U		R			R	R–U					U–C	C					
Amiidae																		
Amia calva Linnaeus, 1766*			R	R														
Clupeidae																		
Alosa pseudoharengus (Wilson, 1811)*	R–U	R																
Dorosoma cepedianum (Lesueur, 1818)*	U	A	C	C–A		C							R–U					
Cyprinidae																		
Campostoma anomalum (Rafinesque, 1820)						C	A			A	U	A	C–A	C–A				
Carassius auratus (Linnaeus, 1758)*			U	U									U					
Clinostomus elongatus (Kirtland, 1838)[2]																		
Cyprinella spiloptera (Cope, 1868)	C		R			C–A	U		R		C	U–C	C					
Cyprinus carpio Linnaeus, 1758			C	U		U	R											
Cyprinus carpio x Carassius auratus			R															
Luxilus chrysocephalus Rafinesque, 1820	R		A	C		A	A			A	U	A	A	C–A				
Luxilus chrysocephalus x Notropis rubellus																		
Lythrurus umbratilis (Girard, 1856)																		
Nocomis micropogon (Cope, 1865)							U				C	R	R					
Notemigonus crysoleucas (Mitchill, 1814)		R	A	A										R				
Notropis amblops (Rafinesque, 1820)						C–A	A					U–C	A	R				
Notropis atherinoides Rafinesque, 1818	C	R	R	R		C	U					R						
Notropis buccatus (Cope, 1865)	R																	
Notropis hudsonius (Clinton, 1824)*	U–C																	
Notropis photogenis (Cope, 1865)			C															
Notropis rubellus (Agassiz, 1850)				U			C–A				R–U	C–A	C					
Notropis stramineus (Cope, 1865)	R					C	U				R–U	U	C					
Notropis volucellus (Cope, 1865)						U	U				R–U	R	U					
Phoxinus erythrogaster (Rafinesque, 1820)[2]										C				R				
Pimephales notatus (Rafinesque, 1820)	U		A	A		A	U–C			R–U	U	C–A	C–A	C–A				
Pimephales promelas Rafinesque, 1820[2]										R				R–U				
Rhinichthys atratulus (Herman, 1804)[2]										C				C–A				
Rhinichthys cataractae (Valenciennes, 1842)*	U																	
Semotilus atromaculatus (Mitchill, 1818)										A	R			A				
Catostomidae																		
Carpiodes cyprinus (Lesueur, 1817)						R	U											
Catostomus commersoni (Lacepede, 1803)				R		R	U			A	U–C	U	C	U				C

Species	Site	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
Petromyzontidae																		
Ichthyomyzon fossor Reighard and Cummins, 1916 (E)				R														
Ichthyomyzon unicuspis Hubbs and Trautman, 1937																		
Lampetra appendix (DeKay, 1842)																		
Petromyzon marinus Linnaeus, 1758				A		A						C			A		U	A
Lepisosteidae																		
Lepisosteus osseus (Linnaeus, 1758)												U					R	
Amiidae																		
Amia calva Linnaeus, 1766*																		
Clupeidae																		
Alosa pseudoharengus (Wilson, 1811)*																		
Dorosoma cepedianum (Lesueur, 1818)*																		
Cyprinidae																		
Campostoma anomalum (Rafinesque, 1820)			A	C		C						R			A		A	U
Carassius auratus (Linnaeus, 1758)*																		
Cliuostomus elongatus (Kirtland, 1838)[2]																		
Cyprinella spiloptera (Cope, 1868)			U	U								U			C		R	C
Cyprinus carpio Linnaeus, 1758																		
Cyprinus carpio x Carassius auratus																		
Luxilus chrysocephalus Rafinesque, 1820			A	C		R						U			A		A	A
Luxilus chrysocephalus x Notropis rubellus			R												R			
Lythrurus umbratilis (Girard, 1856)																		
Nocomis micropogon (Cope, 1865)			U–C			C									C		R	
Notemigonus crysoleucas (Mitchell, 1814)										R								
Notropis amblops (Rafinesque, 1820)			A	A		R						C			A		A	U–C
Notropis atherinoides Rafinesque, 1818												R						
Notropis buccatus (Cope, 1865)			U–C	U								R–U			U		A	
Notropis hudsonius (Clinton, 1824)*																		
Notropis photogenis (Cope, 1865)			R															
Notropis rubellus (Agassiz, 1850)			C	C		R									A		R	
Notropis stramineus (Cope, 1865)			C–A	C		U						C			A		C	
Notropis volucellus (Cope, 1865)			U									C			A		R	R
Phoxinus erythrogaster (Rafinesque, 1820)[2]																		
Pimephales notatus (Rafinesque, 1820)			U–C	C		U						C			A		A	C
Pimephales promelas Rafinesque, 1820[2]																		
Rhinichthys atratulus (Herman, 1804)[2]																		
Rhinichthys cataractae (Valenciennes, 1842)*																		
Semotilus atromaculatus (Mitchell, 1818)						U												C
Catostomidae																		
Carpiodes cyprinus (Lesueur, 1817)			R															
Catostomus commersoni (Lacepede, 1803)			R	U		C				U		U			C		R	C

Species	Site	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53
Petromyzontidae																			
Ichthyomyzon fossor Reighard and Cummins, 1916 (**E**)																			
Ichthyomyzon unicuspis Hubbs and Trautman, 1937																			
Lampetra appendix (DeKay, 1842)																			
Petromyzon marinus Linnaeus, 1758														A					
Lepisosteidae																			
Lepisosteus osseus (Linnaeus, 1758)														R					
Amiidae																			
Amia calva Linnaeus, 1766*																			
Clupeidae																			
Alosa pseudoharengus (Wilson, 1811)*																			
Dorosoma cepedianum (Lesueur, 1818)*																			
Cyprinidae																			
Campostoma anomalum (Rafinesque, 1820)		C							C–A		A							C	
Carassius auratus (Linnaeus, 1758)*																			
Clinostomus elongatus (Kirtland, 1838)[i]																		U–C	
Cyprinella spiloptera (Cope, 1868)		C		C					C										
Cyprinus carpio Linnaeus, 1758									R										
Cyprinus carpio x Carassius auratus																			
Luxilus chrysocephalus Rafinesque, 1820		C	R	C	R				C–A		U–C							C	
Luxilus chrysocephalus x Notropis rubellus																			
Lythrurus umbratilis (Girard, 1856)																			
Nocomis micropogon (Cope, 1865)									R										
Notemigonus crysoleucas (Mitchell, 1814)				R	R														
Notropis amblops (Rafinesque, 1820)				C					C										
Notropis atherinoides Rafinesque, 1818																			
Notropis buccatus (Cope, 1865)		R																	
Notropis hudsonius (Clinton, 1824)*																			
Notropis photogenis (Cope, 1865)																			
Notropis rubellus (Agassiz, 1850)				C					R										
Notropis stramineus (Cope, 1865)				C					U										
Notropis volucellus (Cope, 1865)				C															
Phoxinus erythrogaster (Rafinesque, 1820)[i]																		A	
Pimephales notatus (Rafinesque, 1820)		R		U					U										
Pimephales promelas Rafinesque, 1820[i]											C–A							C–A	
Rhinichthys atratulus (Herman, 1804)[i]		R																	
Rhinichthys cataractae (Valenciennes, 1842)*																			
Semotilus atromaculatus (Mitchell, 1818)		C		U	A						C–A					A		C	
Catostomidae																			
Carpiodes cyprinus (Lesueur, 1817)				R															
Catostomus commersoni (Lacepede, 1803)				C					C		A					U		A	

Species	Site	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71
Petromyzontidae																			
Ichthyomyzon fossor Reighard and Cummins, 1916 (E)																			
Ichthyomyzon unicuspis Hubbs and Trautman, 1937																			
Lampetra appendix (DeKay, 1842)															R				
Petromyzon marinus Linnaeus, 1758				A			C			R					A				C
Lepisosteidae																			
Lepisosteus osseus (Linnaeus, 1758)										R									U
Amiidae																			
Amia calva Linnaeus, 1766*																			
Clupeidae																			
Alosa pseudoharengus (Wilson, 1811)*																			
Dorosoma cepedianum (Lesueur, 1818)*																			
Cyprinidae																			
Campostoma anomalum (Rafinesque, 1820)		C			A					C		R			A				C
Carassius auratus (Linnaeus, 1758)*																			
Clinostomus elongatus (Kirtland, 1838)[2]		C																	
Cyprinella spiloptera (Cope, 1868)		U			C–A					C					U				U
Cyprinus carpio Linnaeus, 1758																			
Cyprinus carpio x Carassius auratus																			
Luxilus chrysocephalus Rafinesque, 1820		C			A					A					C–A	R			C
Luxilus chrysocephalus x Notropis rubellus																			
Lythrurus umbratilis (Girard, 1856)					C–A										R				U
Nocomis macropogon (Cope, 1865)					R														
Notemigonus crysoleucas (Mitchell, 1814)																	C		C
Notropis amblops (Rafinesque, 1820)					U					A					A				A
Notropis atherinoides Rafinesque, 1818																			
Notropis buccatus (Cope, 1865)		R			R					U					C–A				R
Notropis hudsonius (Clinton, 1824)*																			
Notropis photogenis (Cope, 1865)																			
Notropis rubellus (Agassiz, 1850)					R					A					C–A				A
Notropis stramineus (Cope, 1865)					C					C–A					C–A				C
Notropis volucellus (Cope, 1865)					R					U					U–C				R
Phoxinus erythrogaster (Rafinesque, 1820)[2]																			
Pimephales notatus (Rafinesque, 1820)		U			A					C–A		R			A				A
Pimephales promelas Rafinesque, 1820[2]																			
Rhinichthys atratulus (Herman, 1804)[2]		C										R		A		A			
Rhinichthys cataractae (Valenciennes, 1842)*																			
Semotilus atromaculatus (Mitchell, 1818)		C			R							R		A	C	A			
Catostomidae																			
Carpiodes cyprinus (Lesueur, 1817)															R				
Catostomus commersoni (Lacepede, 1803)		R			C					U		A		U	C				A

Species	Site	72	73	74	75	76	77	78	79	80	81	82	83	Occurrence	*f* (%)
Petromyzontidae															
Ichthyomyzon fossor Reighard and Cummins, 1916 (E)														**2**	**3.4**
Ichthyomyzon unicuspis Hubbs and Trautman, 1937														**4**	**6.8**
Lampetra appendix (DeKay, 1842)														**6**	**10.2**
Petromyzon marinus Linnaeus, 1758						A				C				**22**	**37.3**
Lepisosteidae															
Lepisosteus osseus (Linnaeus, 1758)		U				R		U		C				**15**	**25.4**
Amiidae															
Amia calva Linnaeus, 1766*														**2**	**3.4**
Clupeidae															
Alosa pseudoharengus (Wilson, 1811)*														**2**	**3.4**
Dorosoma cepedianum (Lesueur, 1818)*														**5**	**8.5**
Cyprinidae															
Campostoma anomalum (Rafinesque, 1820)		A				A			A			R		**28**	**47.5**
Carassius auratus (Linnaeus, 1758)*														**3**	**5.1**
Clinostomus elongatus (Kirtland, 1838)[2]														**2**	**3.4**
Cyprinella spiloptera (Cope, 1868)						U–C			C			R		**25**	**42.4**
Cyprinus carpio Linnaeus, 1758														**5**	**8.5**
Cyprinus carpio x Carassius auratus									R					**2**	**3.4**
Luxilus chrysocephalus Rafinesque, 1820		A	U			A			A			U–C		**41**	**69.5**
Luxilus chrysocephalus x Notropis rubellus									R					**3**	**5.1**
Lythrurus umbratilis (Girard, 1856)						C–A			C			C		**6**	**10.2**
Nocomis micropogon (Cope, 1865)						R			U					**12**	**20.4**
Notemigonus crysoleucas (Mitchell, 1814)														**9**	**15.3**
Notropis amblops (Rafinesque, 1820)		C				C			C–A			C		**22**	**37.3**
Notropis atherinoides Rafinesque, 1818														**8**	**13.6**
Notropis buccatus (Cope, 1865)						C			R			R		**15**	**25.4**
Notropis hudsonius (Clinton, 1824)*														**1**	**1.7**
Notropis photogenis (Cope, 1865)									R					**3**	**5.1**
Notropis rubellus (Agassiz, 1850)		A				C–A			U–C			C		**20**	**33.9**
Notropis stramineus (Cope, 1865)		C				C–A			R			C		**22**	**37.3**
Notropis volucellus (Cope, 1865)						U			A			C–A		**18**	**30.5**
Phoxinus erythrogaster (Rafinesque, 1820)[2]							C							**3**	**5.1**
Pimephales notatus (Rafinesque, 1820)						A			A			U		**30**	**50.8**
Pimephales promelas Rafinesque, 1820[2]														**2**	**3.4**
Rhinichthys atratulus (Herman, 1804)[2]							U							**10**	**16.9**
Rhinichthys cataractae (Valenciennes, 1842)*														**1**	**1.7**
Semotilus atromaculatus (Mitchell, 1818)		R	R		A	U	U							**22**	**37.3**
Catostomidae															
Carpiodes cyprinus (Lesueur, 1817)						R								**6**	**10.2**
Catostomus commersoni (Lacepede, 1803)		A				C			U			R		**33**	**55.9**

Species	Site	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Catostomidae																			
Hypentelium nigricans (Lesueur, 1817)				R			A	C			R	R	C	C					
Ictiobus bubalus (Rafinesque, 1818)*				U															
Moxostoma anisurum (Rafinesque, 1820)*				U	U														
Moxostoma duquesnei (Lesueur, 1817)			R	C	C		A												
Moxostoma erythrurum (Rafinesque, 1818)				C	C		A	A					C	A					C
Moxostoma macrolepidotum (Lesueur, 1817)*							R												
Ictaluridae																			
Ameiurus melas (Rafinesque, 1820)		C			R		R						R	U					
Ameiurus natalis (Lesueur, 1819)				R	R		R	R											
Ameiurus nebulosus (Lesueur, 1819)*				C	C		R							R					
Ictalurus punctatus (Rafinesque, 1818)							R–U							U					
Noturus flavus Rafinesque, 1818								R					R	R					
Noturus miurus Jordan, 1877							R–U	R								R			
Esocidae																			
Esox americanus Lesueur, 1846		R		U			U					R (1)		R					
Esox lucius Linnaeus, 1758*					R														
Umbridae																			
Umbra limi (Kirtland, 1840)										C							R	A	
Osmeridae																			
Osmerus mordax (Mitchill, 1814)*		R–U	R																
Salmonidae																			
Oncorhynchus mykiss (Walbaum, 1792)			R		R		U	R			R		R		C				
Percopsidae																			
Percopsis omiscomaycus (Walbaum, 1792)*								R											
Cyprinodontidae																			
Fundulus diaphanus (Lesueur, 1817)*		R																	
Albernidae																			
Labidesthes sicculus (Cope, 1865)*					R		R							R					
Gasterosteidae																			
Culaea inconstans (Kirtland, 1841)										A									
Cottidae																			
Cottus bairdi Girard, 1850*		A																	
Percichthyidae																			
Morone americana (Gmelin, 1789)*		U	R				R	U						R					

Species / Site	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
Catostomidae																	
Hypentelium nigricans (Lesueur, 1817)		A	C								C			A		A	C
Ictiobus bubalus (Rafinesque, 1818)*																	
Moxostoma anisurum (Rafinesque, 1820)*																	
Moxostoma duquesnei (Lesueur, 1817)		C												A		R	
Moxostoma erythrurum (Rafinesque, 1818)		C	C								U			A		R	U
Moxostoma macrolepidotum (Lesueur, 1817)*																	
Ictaluridae																	
Ameiurus melas (Rafinesque, 1820)																	
Ameiurus natalis (Lesueur, 1819)					U						R			C		U	U
Ameiurus nebulosus (Lesueur, 1819)*																	
Ictalurus punctatus (Rafinesque, 1818)														R			
Noturus flavus Rafinesque, 1818		U–C	R		U									C		U	U
Noturus miurus Jordan, 1877														U		R	R
Esocidae																	
Esox americanus Lesueur, 1846					U	C											
Esox lucius Linnaeus, 1758*																	
Umbridae																	
Umbra limi (Kirtland, 1840)					R	U			A				C			U	
Osmeridae																	
Osmerus mordax (Mitchill, 1814)*																	
Salmonidae																	
Oncorhynchus mykiss (Walbaum, 1792)			U	R													R
Percopsidae																	
Percopsis omiscomaycus (Walbaum, 1792)*																	
Cyprinodontidae																	
Fundulus diaphanus (Lesueur, 1817)*																	
Atherinidae																	
Labidesthes sicculus (Cope, 1865)*																	
Gasterosteidae																	
Culaea inconstans (Kirtland, 1841)																	
Cottidae																	
Cottus bairdi Girard, 1850*																	
Percichthyidae																	
Morone americana (Gmelin, 1789)*																	

Species	Site	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53
Catostomidae																			
Hypentelium nigricans (Lesueur, 1817)				C					C					A					
Ictiobus bubalus (Rafinesque, 1818)*																			
Moxostoma anisurum (Rafinesque, 1820)*																			
Moxostoma duquesnei (Lesueur, 1817)																			
Moxostoma erythrurum (Rafinesque, 1818)									C–A										
Moxostoma macrolepidotum (Lesueur, 1817)*																			
Ictaluridae																			
Ameiurus melas (Rafinesque, 1820)																			
Ameiurus natalis (Lesueur, 1819)																			
Ameiurus nebulosus (Lesueur, 1819)*																			
Ictalurus punctatus (Rafinesque, 1818)																			
Noturus flavus Rafinesque, 1818				R							R								
Noturus miurus Jordan, 1877																			
Esocidae																			
Esox americanus Lesueur, 1846																			
Esox lucius Linnaeus, 1758*																			
Umbridae																			
Umbra limi (Kirtland, 1840)																			
Osmeridae																			
Osmerus mordax (Mitchill, 1814)*																			
Salmonidae																			
Oncorhynchus mykiss (Walbaum, 1792)											C–A					C			
Percopsidae																			
Percopsis omiscomaycus (Walbaum, 1792)*																			
Cyprinodontidae																			
Fundulus diaphanus (Lesueur, 1817)*																			
Atherinidae																			
Labidesthes sicculus (Cope, 1865)*																			
Gasterosteidae																			
Culaea inconstans (Kirtland, 1841)																			
Cottidae																			
Cottus bairdi Girard, 1850*																			
Percichthyidae																			
Morone americana (Gmelin, 1789)*																			

Species	Site 54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71
Catostomidae																		
Hypentelium nigricans (Lesueur, 1817)				C–A					C					C				A
Ictiobus bubalus (Rafinesque, 1818)*																		
Moxostoma anisurum (Rafinesque, 1820)*																		
Moxostoma duquesnei (Lesueur, 1817)																		
Moxostoma erythrurum (Rafinesque, 1818)				C					C					C–A				C
Moxostoma macrolepidotum (Lesueur, 1817)*																		
Ictaluridae																		
Ameiurus melas (Rafinesque, 1820)																		C
Ameiurus natalis (Lesueur, 1819)																		C
Ameiurus nebulosus (Lesueur, 1819)*																		
Ictalurus punctatus (Rafinesque, 1818)																		
Noturus flavus Rafinesque, 1818			C	C					R									
Noturus miurus Jordan, 1877			R															
Esocidae																		
Esox americanus Lesueur, 1846				U												U		C
Esox lucius Linnaeus, 1758*																		
Umbridae																		
Umbra limi (Kirtland, 1840)				C		R										A		
Osmeridae																		
Osmerus mordax (Mitchill, 1814)*																		
Salmonidae																		
Oncorhynchus nykiss (Walbaum, 1792)																		
Percopsidae																		
Percopsis omiscomaycus (Walbaum, 1792)*																		
Cyprinodontidae																		
Fundulus diaphanus (Lesueur, 1817)*																		
Atherinidae																		
Labidesthes sicculus (Cope, 1865)*																		
Gasterosteidae																		
Culaea inconstans (Kirtland, 1841)																		
Cottidae																		
Cottus bairdi Girard, 1850*																		
Percichthyidae																		
Morone americana (Gmelin, 1789)*																		

Species	Site	72	73	74	75	76	77	78	79	80	81	82	83	Occurrence	*f* (%)
Catostomidae															
Hypentelium nigricans (Lesueur, 1817)		U				C			C–A			U		**24**	**40.7**
Ictiobus bubalus (Rafinesque, 1818)*														**1**	**1.7**
Moxostoma anisurum (Rafinesque, 1820)*														**2**	**3.4**
Moxostoma duquesnei (Lesueur, 1817)									U–C					**8**	**13.6**
Moxostoma erythrurum (Rafinesque, 1818)		C				C			C			R		**22**	**37.3**
Moxostoma macrolepidotum (Lesueur, 1817)*														**1**	**1.7**
Ictaluridae															
Ameiurus melas (Rafinesque, 1820)														**6**	**10.2**
Ameiurus natalis (Lesueur, 1819)									U					**10**	**16.9**
Ameiurus nebulosus (Lesueur, 1819)*														**4**	**6.8**
Ictalurus punctatus (Rafinesque, 1818)														**3**	**5.1**
Noturus flavus Rafinesque, 1818						U			U–C					**16**	**27.1**
Noturus miurus Jordan, 1877									R					**8**	**13.6**
Esocidae															
Esox americanus Lesueur, 1846						C		R	U					**13**	**22**
Esox lucius Linnaeus, 1758*														**1**	**1.7**
Umbridae															
Umbra limi (Kirtland, 1840)		R		R		U			C–A	R		R		**17**	**28.8**
Osmeridae															
Osmerus mordax (Mitchill, 1814)*														**2**	**3.4**
Salmonidae															
Oncorhynchus mykiss (Walbaum, 1792)														**12**	**20.3**
Percopsidae															
Percopsis omiscomaycus (Walbaum, 1792)*														**1**	**1.7**
Cyprinodontidae															
Fundulus diaphanus (Lesueur, 1817)*														**1**	**1.7**
Atherinidae															
Labidesthes sicculus (Cope, 1865)*														**3**	**5.1**
Gasterosteidae															
Culaea inconstans (Kirtland, 1841)														**1**	**1.7**
Cottidae															
Cottus bairdi Girard, 1850*														**1**	**1.7**
Percichthyidae															
Morone americana (Gmelin, 1789)*														5	**8.5**

Site	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Species																		
Percichthyidae																		
Morone chrysops (Rafinesque, 1820)*				R		U												
Centrarchidae																		
Ambloplites rupestris (Rafinesque, 1817)			C	U		A	C					U–C	C					C
Lepomis cyanellus Rafinesque, 1819						R			R	R–U								
Lepomis gibbosus (Linnaeus, 1758)	R	U	A	A		A	R			R–U	R	R	U				R	
Lepomis macrochirus Rafinesque, 1819	R	C	C–A	C		A	U		C	C		U	U–C	U–C		C	C	
Micropterus dolomieu Lacepede, 1802		U	R	R		A	C					U	C					
Micropterus salmoides (Lacepede, 1802)		R	C–A	C–A		C						R		U				
Pomoxis annularis Rafinesque, 1818			R										R					
Pomoxis nigromaculatus (Lesueur, 1829)		R		U		R											R	
Percidae																		
Etheostoma blennioides Rafinesque, 1819							C				U	U–C	C					
Etheostoma caeruleum Storer, 1845							C			C	C	C	C	C				
Etheostoma flabellare Rafinesque,1819							R					R	R	R				
Etheostoma nigrum Rafinesque, 1820	R		R			U	U			C		R	C	C–A				
Perca flavescens (Mitchill, 1814)	R		C	C		C						R						
Percina caprodes (Rafinesque, 1818)	R–U		R			R	U				R	U	R					
Percina maculata (Girard, 1859)						R												
Stizostedion vitreum (Mitchill, 1818)*				U		R	R						R					
Sciaenidae																		
Aplodinotus grunniens Rafinesque, 1819*		R	R			C–A												
Gobiidae																		
Neogobius melanostomus (Pallas, 1814)*		R				C												
Species Richness per Site	**22**	**18**	**31**	**28**	**0**	**43**	**41**	**0**	**7**	**15**	**18**	**38**	**36**	**16**	**4**	**2**	**4**	**3**

Species	Site	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
Percichthyidae																		
Morone chrysops (Rafinesque, 1820)*																		
Centrarchidae																		
Ambloplites rupestris (Rafinesque, 1817)			C									C			A		C	C
Lepomis cyanellus Rafinesque, 1819															R		U	R
Lepomis gibbosus (Linnaeus, 1758)																		
Lepomis macrochirus Rafinesque, 1819										R		U			R		R	U–C
Micropterus dolomieu Lacepede, 1802			C	C								C			A		C	U
Micropterus salmoides (Lacepede, 1802)																		R
Pomoxis annularis Rafinesque, 1818												R						
Pomoxis nigromaculatus (Lesueur, 1829)												R						R
Percidae																		
Etheostoma blennioides Rafinesque, 1819			A	C		C						C			A		C	C
Etheostoma caeruleum Storer, 1845			C	U		C						U–C			A		C	C
Etheostoma flabellare Rafinesque,1819			C												C		U	C
Etheostoma nigrum Rafinesque, 1820			R–U	C		R						C			C		U	U
Perca flavescens (Mitchill, 1814)																		R
Percina caprodes (Rafinesque, 1818)			R												C			
Percina maculata (Girard, 1859)						R						R					R	U–C
Stizostedion vitreum (Mitchill, 1818)*																		
Sciaenidae																		
Aplodinotus grunniens Rafinesque, 1819*																		
Gobiidae																		
Neogobius melanostomus (Pallas, 1814)*																		
Species Richness per Site		**0**	**25**	**19**	**1**	**18**	**2**	**0**	**0**	**4**	**0**	**24**	**0**	**1**	**29**	**0**	**29**	**27**

Species / Site	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53
Percichthyidae																		
Morone chrysops (Rafinesque, 1820)*																		
Centrarchidae																		
Ambloplites rupestris (Rafinesque, 1817)			C															
Lepomis cyanellus Rafinesque, 1819			R															
Lepomis gibbosus (Linnaeus, 1758)																		
Lepomis macrochirus Rafinesque, 1819															R			
Micropterus dolomieu Lacepede, 1802			R										A					
Micropterus salmoides (Lacepede, 1802)																		
Pomoxis annularis Rafinesque, 1818			R															
Pomoxis nigromaculatus (Lesueur, 1829)																		
Percidae																		
Etheostoma blennioides Rafinesque, 1819			C					U										
Etheostoma caeruleum Storer, 1845			R					U		U–C					C		C	
Etheostoma flabellare Rafinesque,1819								R		R					C		U	
Etheostoma nigrum Rafinesque, 1820			A					C		C					C		C	
Perca flavescens (Mitchill, 1814)																		
Percina caprodes (Rafinesque, 1818)																		
Percina maculata (Girard, 1859)																		
Stizostedion vitreum (Mitchill, 1818)*																		
Sciaenidae																		
Aplodinotus grunniens Rafinesque, 1819*																		
Gobiidae																		
Neogobius melanostomus (Pallas, 1814)*																		
Species Richness per Site	**7**	**1**	**20**	**3**	**0**	**0**	**0**	**16**	**0**	**10**	**0**	**0**	**4**	**0**	**7**	**0**	**10**	**0**

Species	Site	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71
Percichthyidae																			
Morone chrysops (Rafinesque, 1820)*																			
Centrarchidae																			
Ambloplites rupestris (Rafinesque, 1817)										C					R				
Lepomis cyanellus Rafinesque, 1819												R							
Lepomis gibbosus (Linnaeus, 1758)												R			U				
Lepomis macrochirus Rafinesque, 1819												U			R	R			U
Micropterus dolomieu Lacepede, 1802		R			C					C					C				
Micropterus salmoides (Lacepede, 1802)												A							
Pomoxis annularis Rafinesque, 1818																			
Pomoxis nigromaculatus (Lesueur, 1829)																			R
Percidae																			
Etheostoma blennioides Rafinesque, 1819					C					U					C–A				C
Etheostomo caeruleum Storer, 1845		C			C					C					C				C
Etheostomo flabellare Rafinesque,1819		U								C				U		U			U
Etheostoma nigrum Rafinesque, 1820					U											C			C
Perca flavescens (Mitchill, 1814)																			
Percina caprodes (Rafinesque, 1818)																			
Percina maculata (Girard, 1859)		R													R				C
Stizostedion vitreum (Mitchill, 1818)*																			
Sciaenidae																			
Aplodinotus grunniens Rafinesque, 1819*																			
Gobiidae																			
Neogobius melanostomus (Pallas, 1814)*																			
Species Richness per Site		**13**	**0**	**3**	**22**	**0**	**2**	**0**	**0**	**20**	**0**	**9**	**0**	**4**	**24**	**6**	**3**	**0**	**26**

Species	Site 72	73	74	75	76	77	78	79	80	81	82	83	Occurrence	*f* (%)
Percichthyidae														
Morone chrysops (Rafinesque, 1820)*													2	3.4
Centrarchidae														
Ambloplites rupestris (Rafinesque, 1817)	U–C				U			C–A			U		19	32.2
Lepomis cyanellus Rafinesque, 1819								R–U					9	15.3
Lepomis gibbosus (Linnaeus, 1758)					R			R					15	25.4
Lepomis macrochirus Rafinesque, 1819					C–A			R			R		26	44.1
Micropterus dolomieu Lacepede, 1802	C				U			C			R		27	45.8
Micropterus salmoides (Lacepede, 1802)					R			R					10	16.9
Pomoxis annularis Rafinesque, 1818													4	6.8
Pomoxis nigromaculatus (Lesueur, 1829)								R					8	13.6
Percidae														
Etheostoma blennioides Rafinesque, 1819	C				U			A			U		21	35.6
Etheostoma caeruleum Storer, 1845	C				C			A			U		27	45.8
Etheostoma flabellare Rafinesque,1819					R			C–A			R		20	33.9
Etheostoma nigrum Rafinesque, 1820	C				C			C			C		27	45.8
Perca flavescens (Mitchill, 1814)					R								7	11.9
Percina caprodes (Rafinesque, 1818)								U–C					10	16.9
Percina maculata (Girard, 1859)					R			C					10	16.9
Stizostedion vitreum (Mitchill, 1818)*													4	6.8
Sciaenidae														
Aplodinotus grunniens Rafinesque, 1819*													3	5.1
Gobiidae														
Neogobius melanostomus (Pallas, 1814)*													2	3.4
Species Richness per Site	16	3	0	1	32	3	3	35	3	0	20	0		

Appendix 3. Taxa of amphibians and reptiles and an abundance designation for each taxon recorded at each site. See methods section (p. 4–5) for an explanation of designation symbols. Letters in parentheses following a binomial name indicate the status within Ohio as classified by ODNR Division of Wildlife (2002): (E) Endangered, (T) Threatened. Abundance designations followed by a superscript (°) denotes salvaged specimens.

Species \ Site	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Ambystomatidae																		
Ambystoma jeffersonianum (Green, 1827)																		
Ambystoma maculatum (Shaw, 1802)								U–C										
Ambystoma platineum (Cope, 1868)																		
Plethodontidae																		
Desmognathus fuscus (Green, 1818)										R								
Desmognathus ochrophaeus Cope, 1859								C		C–A		R	U	C				
Eurycea bislineata (Green, 1818)										U		R	R	A				
Plethodon cinereus (Green, 1818)								C (9)		R (2)								
Plethodon glutinosus (Green, 1818)										R (1)				1				
Proteidae																		
Necturus maculosus (Rafinesque, 1818)							A (37)°						R (1)					C (5)
Salamandridae																		
Notophthalmus viridescens (Rafinesque, 1820)						C												
Bufonidae																		
Bufo americanus Holbrook, 1836	C					C		U		R		C	U–C	U–C				U
Bufo fowleri Hinkley, 1882													R	R				
Hylidae																		
Hyla versicolor LeConte, 1825								U–C										
Pseudacris crucifer (Wied-Neuwied, 1838)								U–C								U	C–A	
Ranidae																		
Rana catesbeiana Shaw, 1802						U	C	R				R	U				U	
Rana clamitans Latreille, 1801						C		C	R	U		C	C	U		U	A	
Rana palustris LeConte, 1825							C	U	A			C–A	C					U
Rana pipiens Schreber, 1782					P			R–U								R	U–C	
Rana sylvatica LeConte, 1825																		
Chelydridae																		
Chelydra serpentina (Linnaeus, 1758)												1	C (3)			U (2)	C (5)	U (2)
Kinosternidae																		
Sternotherus odoratus (Latreille, 1801)																		
Emydidae																		
Chrysemys picta (Schneider, 1783)													R (1)				C (11)	
Clemmys guttata (Schneider, 1792) (T)																		
Trionychidae																		
Apalone spinifera (Lesueur, 1827)																		C (3)
Colubridae																		
Diadophis punctatus Linnaeus, 1766																		
Elaphe obsoleta (Say, 1823)																	1	
Lampropeltis triangulum (Lacepede, 1788)																		
Nerodia sipedon (Linnaeus, 1758)							3	1		2		A (18)	C (7)					U (2)
Regina septemvittata (Say, 1825)																		
Storeria dekayi (Holbrook, 1836)												1						
Storeria occipitomaculata (Storer, 1839)																		
Thamnophis sauritus (Linnaeus, 1766)																		
Thamnophis sirtalis (Linnaeus, 1758)												C (6)	C (5)					
Species Richness per Site	**1**	**0**	**0**	**0**	**1**	**4**	**4**	**11**	**2**	**8**	**0**	**10**	**12**	**6**	**0**	**4**	**7**	**6**

Species	Site	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
Ambystomatidae																		
Ambystoma jeffersonianum (Green, 1827)																		
Ambystoma maculatum (Shaw, 1802)									C	C				C				
Ambystoma platineum (Cope, 1868)																		
Plethodontidae																		
Desmognathus fuscus (Green, 1818)				R–U	U													
Desmognathus ochrophaeus Cope, 1859				C	U			C		C				C				
Eurycea bislineata (Green, 1818)																		
Plethodon cinerens (Green, 1818)		U (2)		U (2)				U (3)										
Plethodon glutinosus (Green, 1818)				1				C (3)										
Proteidae																		
Necturus maculosus (Rafinesque, 1818)			R (1)	R (1)						R (1)		U (3)	C (12)[5]				C (21)[5]	
Salamandridae																		
Notophthalmus viridescens (Rafinesque, 1820)										R								
Bufonidae																		
Bufo americanus Holbrook, 1836			C	R	U			C	C	C		U–C		C				
Bufo fowleri Hinkley, 1882			R–U				U											
Hylidae																		
Hyla versicolor LeConte, 1825										P (T)								
Pseudacris crucifer (Wied-Neuwied, 1838)				U					A					C				
Ranidae																		
Rana catesbeiana Shaw, 1802			R	U						P (T)		U		U				
Rana clamitans Latreille, 1801			C		R		C			A		R		C			C	
Rana palustris LeConte, 1825			R							C		C		U				
Rana pipiens Schreber, 1782										A								R–U
Rana sylvatica LeConte, 1825									C					U				
Chelydridae																		
Chelydra serpentina (Linnaeus, 1758)			U (2)									1	1					
Kinosternidae																		
Sternotherus odoratus(Latreill, 1801)																		
Emydidae																		
Chrysemys picta (Schneider, 1783)																		
Clemmys guttata (Schneider, 1792)(T)																		
Trionychidae																		
Apalone spinifera (Lesueur, 1827)			R (1)									U (2)						
Colubridae																		
Diadophis punctatus Linnaeus, 1766																		
Elaphe obsoleta (Say, 1823)					1												1	
Lampropeltis triangulum (Lacepede, 1788)				1							1							
Nerodia sipedon (Linnaeus, 1758)			U (3)	1						1		1				1	1	
Regina septemvittata (Say, 1825)																		
Storeria dekayi (Holbrook,1836)																		
Storeria occipitomaculata (Storer, 1839)																		
Thamnophis sauritus (Linnaeus, 1766)																		
Thamnophis sirtalis (Linnaeus, 1758)			1	1														
Species Richness per Site		**1**	**10**	**11**	**5**	**0**	**2**	**4**	**4**	**11**	**1**	**8**	**2**	**8**	**0**	**1**	**4**	**1**

Species	Site	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53
Ambystomatidae																			
Ambystoma jeffersonianum (Green, 1827)						R	R–U	R								P(E)			
Ambystoma inaculatum (Shaw, 1802)			U	R		U	U–C	C		P (L)		P (L)				P (L)		P (L)	P (L)
Ambystoma platineum (Cope, 1868)								R											
Plethodontidae																			
Desmognathus fuscus (Green, 1818)			U		R			R		R	R		C		R	R		R	R
Desmognathus ochrophaeus Cope, 1859			C–A		C			C	C		A		U	U	R	A		R	A
Eurycea bislineata (Green, 1818)			U		U				U		C			R	R	R		R	U
Plethodon cinereus (Green, 1818)			U (3)					U (5)	R (1)									U (3)	
Plethodon glutinosus (Green, 1818)			C (8)	R (1)				C (6)			U (2)					C (3)		U (1)	
Proteidae																			
Necturus maculosus (Rafinesque, 1818)																			
Salamandridae																			
Notophthalmus viridescens (Rafinesque, 1820)			U				U–C	C										R	
Bufonidae																			
Bufo americanus Holbrook, 1836			C	C–A				C	C					C				U	
Bufo fowleri Hinkley, 1882																			
Hylidae																			
Hyla versicolor LeConte, 1825							C												
Pseudacris cruc ifer (Wied-Neuwied, 1838)			U				C									P (T)			
Ranidae																			
Rana catesbeiana Shaw, 1802					R		R–U		C									R	
Rana clamitans Latreille, 1801		C	U				C		C		C			U		C		C	
Rana palustris LeConte, 1825			R	C					A		C		R	C–A				R	R
Rana pipiens Schreber, 1782											R							R	
Rana sylvatica LeConte, 1825			R							P (T)						U		R	
Chelydridae																			
Chelydra serpentina (Linnaeus, 1758)							C (2)	U											
Kinosternidae																			
Sternotherus odoratus (Latreille, 1801)																			
Emydidae																			
Chrysemys picta (Schneider, 1783)							1	C (2)											
Clemmys guttata (Schneider, 1792)(T)																			
Trionychidae																			
Apalone spinifera (Lesueur, 1827)																			
Colubridae																			
Diadophis punctatus Linnaeus, 1766			U (2)																
Elaphe obsoleta (Say, 1823)			U (1)				U (1)										1		
Lampropeltis triangulum (Lacepede, 1788)																	1		
Nerodia sipedon (Linnaeus, 1758)									2					A (12)				1	
Regina septemvittata (Say, 1825)														U (2)					
Storeria dekayi (Holbrook,1836)														1					
Storeria occipitomaculata (Storer, 1839)							U (2)												
Thamnophis sauritus (Linnaeus, 1766)														R (1)		R (1)			
Thamnophis sirtalis (Linnaeus, 1758)				1			C (7)												
Species Richness per Site		**1**	**14**	**5**	**4**	**2**	**12**	**11**	**8**	**3**	**7**	**1**	**3**	**9**	**3**	**10**	**2**	**14**	**5**

Species / Site	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71
Ambystomatidae																		
Ambystoma jeffersonianum (Green, 1827)																		
Ambystoma maculatum (Shaw, 1802)							P (L)										P (L)	
Ambystoma platineum (Cope, 1868)																		
Plethodontidae																		
Desmognathus fuscus (Green, 1818)	R	C		R					R	U	U			R	U			
Desmognathus ochrophaeus Cope, 1859	A			A		C		C	A				A	R			A	
Eurycea bislineata (Green, 1818)	U	C									A		U		R			
Plethodon cinereus (Green, 1818)				1		C (6)		C (6)					R (1)					
Plethodon glutinosus (Green, 1818)	C (2)			1		C (5)							C (4)					
Protcidae																		
Necturus maculosus (Rafinesque, 1818)			A (25)[2]											A (56)[3]				
Salamandridae																		
Notophthalmus viridescens (Rafinesque, 1820)						U	R			R						U		
Bufonidae																		
Bufo americanus Holbrook, 1836	U			C		C			U					C				
Bufo fowleri Hinkley, 1882																		
Hylidae																		
Hyla versicolor LeConte, 1825																	C	
Pseudacris crucifer (Wied-Neuwied, 1838)							P (T)				P (T)	A						
Ranidae																		
Rana catesbeiana Shaw, 1802			R	U										P (T)				C
Rana clamitans Latreille, 1801	U	R		C		C	C		U		P (T)			C	C	R	A	
Rana palustris LeConte, 1825		U		C–A		C								C		C	U	
Rana pipiens Schreber, 1782																		
Rana sylvatica LeConte, 1825	U	R										C						
Chelydridae																		
Chelydra serpentina (Linnaeus, 1758)				1														
Kinosternidae																		
Sternotherus odoratus (Latreille, 1801)																		
Emydidae																		
Chrysemys picta (Schneider, 1783)																		
Clemmys guttata (Schneider, 1792)(**T**)																		
Trionychidae																		
Apalone spinifera (Lesueur, 1827)																		
Coluhridae																		
Diadophis punctatus Linnaeus, 1766																		
Elaphe obsoleta (Say, 1823)									1									
Lampropeltis triangulum (Lacepede, 1788)					1			U (1)										
Nerodia sipedon (Linnaeus, 1758)				U (4)														
Regina septemvittata (Say, 1825)				1														
Storeria dekayi (Holbrook,1836)								1					1					
Storeria occipitomaculata (Storer, 1839)																		
Thamnophis sauritus (Linnaeus, 1766)					1													
Thamnophis sirtalis (Linnaeus, 1758)					C (4)			C (2)							U			
Species Richness per Site	**7**	**5**	**2**	**11**	**3**	**7**	**4**	**5**	**5**	**2**	**4**	**2**	**5**	**7**	**4**	**3**	**5**	**1**

Species	Site 72	73	74	75	76	77	78	79	80	81	82	83	Occurrence	f (%)
Ambystomatidae														
Ambystoma jeffersonianum (Green, 1827)													4	5.2
Ambystoma maculatum (Shaw, 1802)					U			R	P (L)				19	24.7
Ambystoma platineum (Cope, 1868)													1	1.3
Plethodontidae														
Desmognathus fuscus (Green, 1818)		C–A		C		C	R					U	26	33.8
Desmognathus ochrophaeus Cope, 1859	U	C–A		C–A	U		C	A			C	A	37	48.1
Eurycea bislineata (Green, 1818)	R	C		U		A						U	24	31.2
Plethodon cinereus (Green, 1818)						R (1)							14	18.2
Plethodon glutinosus (Green, 1818)	1	C (2)		1	R (1)							1	19	24.7
Proteidae														
Necturus maculosus (Rafinesque, 1818)					U (3)[a]						C (6)		13	16.9
Salamandridae														
Notophthalmus viridescens (Rafinesque, 1820)							R						11	14.3
Bufonidae														
Bufo americanus Holbrook, 1836	C	U			C–A		C	C	R		C	C	35	45.5
Bufo fowleri Hinkley, 1882													4	5.2
Hylidae														
Hyla versicolor LeConte, 1825					P								5	6.5
Pseudacris crucifer (Wied-Neuwied, 1838)					C					U	U–C		15	19.5
Ranidae														
Rana catesbeiana Shaw, 1802		R			R		R	C			U–C		24	31.2
Rana clamitans Latreille, 1801	C	U		C	U	R	A	P (T)					42	54.5
Rana palustris LeConte, 1825	C			C	C–A		A	C					29	37.7
Rana pipiens Schreber, 1782	R				U								10	13
Rana sylvatica LeConte, 1825	R						R						11	14.3
Chelydridae														
Chelydra serpentina (Linnaeus, 1758)					C (7)								12	15.6
Kinosternidae														
Sternotherus odoratus (Latreille, 1801)											R (1)		1	1.3
Emydidae														
Chrysemys picta (Schneider, 1783)					R (1)		1	1	1				8	10.4
Clemmys guttata (Schneider, 1792)(T)					R (1)								1	1.3
Trionychidae														
Apalone spinifera (Lesueur, 1827)													3	3.9
Colubridae														
Diadophis punctatus Linnaeus, 1766													1	1.3
Elaphe obsoleta (Say, 1823)													7	9.1
Lampropeltis triangulum (Lacepede, 1788)													5	6.5
Nerodia sipedon (Linnaeus, 1758)					A (17)		C (3)	U (2)	R (1)		C (3)	2	22	28.6
Regina septemvittata (Say, 1825)					U (2)		1				C (5)	2	6	7.8
Storeria dekayi (Holbrook,1836)					C (3)								5	6.5
Storeria occipitomaculata (Storer, 1839)													1	1.3
Thamnophis sauritus (Linnaeus, 1766)													3	3.9
Thamnophis sirtalis (Linnaeus, 1758)			1		U (2)								11	14.3
Species Richness per Site	8	7	1	6	18	4	11	8	4	1	8	7		

Appendix 4. New drainage system records of fishes, amphibians, and reptiles in the Ohio portion of Conneaut Creek. The source and year of the collection record are listed in column three: United States Fish and Wildlife Service (USFWS), Ohio Environmental Protection Agency (OEPA), and Cleveland Museum of Natural History (CMNH). All CMNH records are represented by a vouchered specimen or photographic voucher (pv).

Scientific name	Common name	Source (year)
Lampetra appendix	American Brook Lamprey	USFWS
Ichthyomyzon fossor	Northern Brook Lamprey	USFWS
Amia calva	Bowfin	OEPA (1998)
Alosa pseudoharengus	Alewife	CMNH (1973)
Dorosoma cepedianum	Gizzard Shad	CMNH (1973)
Osmerus mordax	Rainbow Smelt	CMNH (1973)
Umbra limi	Central Mudminnow	CMNH (1996)
Notemigonus crysoleucas	Golden Shiner	CMNH (1998)
Notropis photogenis	Silver Shiner	OEPA (1999)
Pimephales promelas	Fathead Minnow	CMNH (2000)
Pimephales promelas	Rosy Red Minnow	CMNH (2000)
Moxostoma anisurum	Silver Redhorse	OEPA (1998)
Moxostoma duquesnei	Black Redhorse	OEPA (1998)
Moxostoma macrolepidotum	Shorthead Redhorse	OEPA (8 August-27 Sept. 1989)
Fundulus diaphanus	Eastern Banded Killifish	CMNH (1992)
Morone americana	White Perch	CMNH (1992)
Neogobius melanostomus	Round Goby	OEPA (1998)
Apalone spinifera	Eastern Spiny Softshell	CMNH (1999)
Sternotherus odoratus	Stinkpot	CMNH (2003) (pv)
Elaphe obsoleta	Black Rat Snake	CMNH (2001)

Appendix 5. New Ashtabula County Township records for amphibians and reptiles within the Ohio portion of the Conneaut Creek drainage system. An (*) following the township name indicates that no voucher is available; (pv) indicates that only a photographic slide voucher is available. Townships not designated are represented by a vouchered specimen.

Scientific name	Common name	Township	Date
Bufo americanus	American Toad	Monroe	12 July 1996
Hyla versicolor	Common Gray Treefrog	Kingsville	2 July 1996
		Monroe	10 July 1996
Rana catesbeiana	American Bullfrog	Monroe	21 October 1990
Rana pipiens	Northern Leopard Frog	Kingsville	13 July 2000
Chelydra serpentina	Common Snapping Turtle	Conneaut	25 August 1999
		Monroe	2 August 1999
Sternotherus odoratus	Stinkpot	Conneaut (pv)	13 April 2003
Chrysemys picta	Midland Painted Turtle	Conneaut (pv)	17 August 1999
Apalone spinifera	Eastern Spiny Softshell Turtle	Conneaut	19 August 1999
		Monroe (pv)	28 June 2000
Diadophis punctatus	Ring-necked Snake	Kingsville	25 September 1996
Elaphe obsoleta	Black Rat Snake	Kingsville	15 May 2001
		Conneaut (*)	10 August 1999
Lampropeltis triangulum	Eastern Milksnake	Kingsville	13 June 2000
		Monroe	3 July 2001
Nerodia sipedon	Northern Water Snake	Kingsville	2 July 1996
Regina septemvittata	Queen Snake	Kingsville	27 June 2000
		Monroe (pv)	21 August 2000
Thamnophis sauritus	Ribbon Snake	Kingsville	28 August 2002
Thamnophis sirtalis	Eastern Garter Snake	Conneaut	20 July 1999